

CONTENTS

Preface	vii
---------------	-----

Part I: Issues

1. Whither Algorithms? Mathematics Educators Express Their Views	1
LORNA J. MORROW <i>Aurora, Ontario</i>	
2. Paper-and-Pencil Algorithms in a Calculator-and-Computer Age	7
ZALMAN USISKIN <i>University of Chicago, Chicago, Illinois</i>	
3. What Is an Algorithm? What Is an Answer?	21
STEPHEN B. MAURER <i>Swarthmore College, Swarthmore, Pennsylvania</i>	
4. Algorithmic and Recursive Thinking: Current Beliefs and Their Implications for the Future	32
TABITHA T. Y. MINGUS <i>Morehead State University, Morehead, Kentucky</i>	
RICHARD M. GRASSL <i>University of Northern Colorado, Greeley, Colorado</i>	
5. Teaching Mental Algorithms Constructively	44
ALISTAIR MCINTOSH <i>Edith Cowan University, Churchlands, Western Australia</i>	
6. What Criteria for Student-Invented Algorithms?	49
PATRICIA F. CAMPBELL <i>University of Maryland, College Park, Maryland</i>	
THOMAS E. ROWAN <i>Western Maryland College, Westminster, Maryland</i>	
ANNA R. SUAREZ <i>Burnt Mills Elementary School, Silver Spring, Maryland</i>	
7. The Importance of Algorithms in Performance-Based Assessments	56
DOMINIC PERESSINI <i>University of Colorado at Boulder, Boulder, Colorado</i>	
ERIC KNUTH <i>University of Colorado at Boulder, Boulder, Colorado</i>	

Part 2: History

8. A Brief History of Algorithms in Mathematics 69
 JANET HEINE BARNETT
University of Southern Colorado, Pueblo, Colorado
9. Understanding Algorithms from Their History 78
 BARNABAS HUGHES, O.F.M.
California State University/Northridge, Northridge, California
10. An Exploration of the Russian Peasant Method of Multiplication . . . 81
 LAURA SGROI
State University of New York/College at New Paltz, New Paltz, New York
11. Hammurabi's Calculator 86
 CLIFFORD WAGNER
Penn State University at Harrisburg, Middletown, Pennsylvania
12. Capsule Lessons in Alternative Algorithms for the Classroom 91
 DIANE E. MASON
Indian Hills Community College, Centerville, Iowa
13. Historical Algorithms: Sources for Student Projects 99
 RHETA N. RUBENSTEIN
Schoolcraft College, Livonia, Michigan

Part 3: Curriculum and Instruction—Elementary Grades

14. Alternative Algorithms for Whole-Number Operations 106
 WILLIAM M. CARROLL
University of Chicago School Mathematics Project, Chicago, Illinois
 DENISE PORTER
University of Chicago School Mathematics Project, Chicago, Illinois
15. My Family Taught Me This Way 115
 PILAR RON
Northwestern University, Evanston, Illinois
16. Calculators in Primary Mathematics:
 Exploring Number before Teaching Algorithms. 120
 SUSIE GROVES
Deakin University, Burwood, Victoria, Australia
 KAYE STACEY
University of Melbourne, Parkville, Victoria, Australia
17. The Harmful Effects of Algorithms in Grades 1–4 130
 CONSTANCE KAMII
University of Alabama at Birmingham, Birmingham, Alabama
 ANN DOMINICK
South Shades Crest Elementary School, Hoover, Alabama

18. **A Contextual Investigation of Three-Digit Addition and Subtraction** 141
KAY MCCLAIN
Vanderbilt University, Nashville, Tennessee
PAUL COBB
Vanderbilt University, Nashville, Tennessee
JANET BOWERS
San Diego State University, Center for Mathematics and Science Education, San Diego, California
19. **Children's Invented Algorithms for Multidigit Multiplication Problems** 151
JAE-MEEN BAEK
University of Wisconsin—Madison, University Center for Education Research, Madison, Wisconsin
20. **The "Write" Way to Mathematical Understanding** 161
DAVID J. WHITIN
University of South Carolina, Columbia, South Carolina
PHYLLIS E. WHITIN
Dutch Fork Elementary School, Irmo, South Carolina

Part 4: Curriculum and Instruction—Middle Grades

21. **Letting Fraction Algorithms Emerge through Problem Solving** . . . 170
DEANN HUINKER
University of Wisconsin—Milwaukee, Milwaukee, Wisconsin
22. **Developing Algorithms for Adding and Subtracting Fractions** . . . 183
GLENDA LAPPAN
Michigan State University, East Lansing, Michigan
MARY K. BOUCK
Battle Creek Public Schools, Battle Creek, Michigan
23. **A Constructed Algorithm for the Division of Fractions** 198
JANET SHARP
Iowa State University, Ames, Iowa
24. **Dividing Fractions by Using the Ratio Table** 204
JONATHAN L. BRENDENFUR
University of Wisconsin—Madison, Madison, Wisconsin
RUTH C. PITINGORO
Bethel Junior High School, Puyallup, Washington
25. **Teaching Statistics: What's Average?** 208
SUSAN N. FRIEL
University of North Carolina at Chapel Hill, Chapel Hill, North Carolina

26. Algorithms for Solving Nonroutine Mathematical Problems 218

JINEFA CAI

University of Delaware, Newark, Delaware

JOHN C. MOYER

Marquette University, Milwaukee, Wisconsin

CONNIE LAUGHLIN

*Mequon-Thiensville Schools, Milwaukee, Wisconsin***Part 5: Curriculum and Instruction—Secondary Grades****27. Algebra and Technology 230**

ANN BRUNNER

Glenbrook South High School, Glenview, Illinois

KATHY COSKEY

Glenbrook South High School, Glenview, Illinois

SHARON K. SHEEHAN

*Glenbrook South High School, Glenview, Illinois***28. A New Look at an Old Algorithm: The Semiaverage Line 239**

MICHAEL McNAMARA

*LaSalle Academy, Providence, Rhode Island***29. Random-Number Generators: A Mysterious Use of Algorithms . . . 243**

STEPHANIE O. ROBINSON

University of Tennessee/Knoxville, Knoxville, Tennessee

DONALD J. DESSERT

*University of Tennessee/Knoxville, Knoxville, Tennessee***30. Algorithmic Problem Solving in Discrete Mathematics 251**

ERIC W. HART

*Western Michigan University, Kalamazoo, Michigan;**Maharishi University of Management, Fairfield, Iowa***31. The Traveling Salesperson: Some Algorithms Are Different 268**

LOWELL LEAKE

*University of Cincinnati, Cincinnati, Ohio***32. Using Algorithms to Generate Objects of Mathematical Interest . . . 274**

ELAINE SIMMT

University of Alberta, Edmonton, Alberta

